# ISAE-SS2 – Introduction to Aircraft Structures

## OBJECTIVES

This course is an introduction to the preliminary design of aircraft structures. It is mainly focused on the basic concerns required before pre-sizing aircraft structures. The general architecture of aircraft structures is described to justify the interest in the use of the Beam Theory. The Beam Theory is then reminded then focused on the thin walled sections and hyperstaticity. It is then applied to analysis of load transfer within joints. A particular emphasis on the stress analysis on thin walled structure is offered through the presentation of an industrial case. Finally, a fundamental opening on Fatigue and Damage Tolerance (F&DT) applied to aircraft structures is offered from an industrial point of view.

The aims of the module are the following:

- To be able to explain the main problems to be considered when pre-sizing aircraft structures
- To be able to explain how aircraft structures are designed
- To be able to explain how thin walled structures are loaded
- To be able to compute the induced loads in thin-walled structures
- To be able to explain the stakes linked to F&DT
- To be able to perform elementary F&DT analyses

## Pre-requisites:

- Fundamentals of continuum mechanics
- Fundamentals of Solid Mechanics
- Basic of Beam Theory

## Organization

- 24x lectures, tutorials and project kick off (24h)
- 2x workshops (4h)
- Intermediate project review and final defense (2h)

### Total: 30 hours (excluding written examination, revision time, work on project and personal work)

Estimated personal work: 73 hours

## Evaluation

- 30% : 1 written exam (2h)
- 25%+25% : 1 oral defense for each of both projects
- 10%+10% : 2 workshops

## CONTENTS

- General architecture of aircraft structures
- Review of basic of Beam Theory
- Focus of Beam Theory on thin section walled section and hyperstatic condition
- Analysis of load transfer within joints through the use of the Beam Theory
- Emphasis on the thin walled structures
- Elements of Linear Fracture Mechanics and of Metallurgy in view of F&DT
- F&DT stakes and basic method for aircraft structures design

## Bibliography:


## Course director:

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## US CREDIT HOURS / ECTS: 3 / 6